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SURVEY OF PENNSYLVANIA

MIGRATORY WATERFOWL

FINAL REPORT

PITTMAN – ROBERTSON PROJECT 30-R

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COMMONWEALTH OF PENNSYLVANIA

JAMES H. DUFF, *Governor*

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SURVEY OF PENNSYLVANIA MIGRATORY WATERFOWL

By CARL R. WARREN

Project Leader

PUBLISHED BY

PENNSYLVANIA GAME COMMISSION

HARRISBURG

1950

INTRODUCTION AND OBJECTIVES

Every state in the Union and every province in Canada has a certain part to play in the continental waterfowl drama. As in a play, some are cast in major roles, some in minor roles, while others provide "just scenery."

The uninitiated human eye is ofttimes apt to be bedazzled by those states and provinces having much suitable waterfowl habitat supporting perhaps hundreds of thousands of waterfowl in season, and, at the same time, apt to overlook waterfowl potentials of the "lesser lights."

On last analysis, the "inbetwixt" states—as Pennsylvania, lying between the great breeding and wintering grounds—do have a role to play. The objective of this project is to define that role, to evaluate it, and to point out ways and means of making that role more important if possible; in short, to determine whether or not it is physiographically possible and biologically sound to improve waterfowl conditions and waterfowl hunting within the Commonwealth of Pennsylvania.

This study, Pittman-Robertson Project 30-R, was conducted under the Federal Aid to Wildlife Restoration Act of 1937 and was supervised jointly by the Pennsylvania Game Commission and the United States Fish and Wildlife Service.

One has but to study *Table 1* of this report, in which Dr. Harold Wood lists the authentic records of the kill of a professional duck hunter on the Susquehanna River at Harrisburg, to realize that, while many consider Pennsylvania to be a "duckless" state, at least the records indicate that, if true now, such was not always the case. The fact that there were 47,389 duck stamps purchased by various individuals in the Commonwealth during the year ending June 30, 1949 proves that even today there is a considerable number of people interested in waterfowl.

ACKNOWLEDGMENTS

Very seldom does man succeed alone, and it is therefore with great pleasure that the writer acknowledges the unselfish assistance given at all times by the district man—the Pennsylvania Game Protector. He is also indebted to the men who did the all-important work of actually trapping the ducks and banding them; Mr. Charles Strohm who banded ducks in 1949 on the Pymatuning Refuge, and Mr. W. R. Ketner of the Reading Reservoir Refuge who banded ducks on that area the same year.

Dr. F. W. Preston, Preston Laboratories, Butler, Pennsylvania, as well as Mr. F. R. Laying, former vice-president of the Bessemer Railroad, Greenville, Pennsylvania, contributed much to our knowledge of the glaciated northwestern portion of Pennsylvania. Both stand willing to contribute additional advice regarding the handling of impoundments constructed in certain areas where footing seems precarious, particularly in certain back-filled glacial valleys.

The author is greatly indebted to the City of Reading for permitting trapping and banding waterfowl on its water-supply reservoir on Maiden Creek of the Schuylkill River.

Mr. Russell Norris, biologist, U. S. Fish and Wildlife Service, Boston, Massachusetts and the U. S. Corps of Army Engineers of both the Pittsburgh and Philadelphia offices cooperated with the author on a basin study of proposed and actual flood-control impoundments in Pennsylvania. Mr. Norris and the Philadelphia office also cooperated with the author in a preliminary study of the Tinicum Marshes in Delaware and Philadelphia Counties, Pennsylvania.

To Mr. Seth Low, biologist, U. S. Fish and Wildlife Service, Patuxent Wildlife Research Refuge, Laurel, Maryland and his excellent staff in the Distribution and Migration of Birds Section, the writer is indebted for waterfowl bands and services in a clearinghouse capacity in waterfowl migration studies. Without these services *Maps II*, *III*, and *IV* of this report would have been impossible.

Mr. P. M. Lollich, Senior Game Land Engineer, Pennsylvania Game Commission, graciously permitted the author to utilize his section, particularly Messrs, Mackey and Miller, to plot *Maps II*, *III* and *IV*, as well as to draw plans for a waterfowl trap (*Figures 1 and 2*).

To Dr. Harold B. Wood, Harrisburg, a well-known ornithologist, the writer is indebted for *Table 1, The Records of a Professional Duck Hunter.* The author is also indebted to Mr. Hardie Disney of West Fairview, Pennsylvania who made and kept these records during an age when market hunting was legal.

Permission to use the outline maps of the United States on which waterfowl returns have been plotted was granted by the American Map Company.

Map I, Physiographic Subdivision of Pennsylvania was obtained from Topographic and Geologic Survey, Department of Internal Affairs. This department also furnished the U. S. topographic quadrangles necessary to carry on the actual field work.

Robert D. McDowell, Chief, Wildlife Research Division, Pennsylvania Game Commission, supervised and directed the work.

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HISTORY AND PROCEDURE

The physiography of Pennsylvania is such that, when we have waterfowl management in mind, our attention is naturally attracted to:

(1) The glaciated northwestern section, including Presque Isle and the Erie Bay region

(2) The glaciated northeastern section

(3) The larger streams—especially the Susquehanna and the Delaware rivers

(4) The coastal plain province extending from the Morrisville (Pa.)-Trenton (N. J.) region downstream along the Delaware River culminating, at least on the Pennsylvania side of the river, in the Tinicum Marshes of Philadelphia and Delaware counties. (See *Map I*)

A comparison of *Map I* of this report with topographic quadrangles reveals that apparently more may be done for waterfowl in the four situations above than can be accomplished elsewhere in the state. We are compelled to accept the fact that geological history has largely determined for us the geographical limits of waterfowl developments of any magnitude.

Continuing our reasoning along this line we may safely assume that, even within the four possibilities mentioned above, there are some areas where a given amount of effort would produce more results than were the same effort expended elsewhere. It was to determine where these strategic points are located, and what could be expected of them if developed, with which most of the field work of this project was concerned. The results of this work comprise the bulk of a confidential report to the Pennsylvania Game Commission and is not a part of this, the final report.

To obtain the information comprising the bulk of the confidential report, thousands of miles were driven. Hundreds of physiographical situations were studied on the ground aided by various pertinent topographic quadrangles and the necessary aerial photos. The information thus obtained, combined with the information contained herein, will give a fairly comprehensive plan for a statewide waterfowl management program.

BAG AND BANDING RECORDS

Bag Records and the Susquehanna River

Table 1, Records of a Professional Duck Hunter, gives us some idea of the relative abundance of the different species in years gone by. In addition, these data are valuable because, while it is likely that waterfowl conditions and numbers can never attain such optimum levels to produce such results as are tabulated, nevertheless it can be stated that, in attempting to restore waterfowl to something of their past numbers, we have on the Susquehanna an ancestoral flightlane of unquestionable importance. It is only proper that an attempt be made on it to manage waterfowl.

Table 1

The Records of a Professional Duck Hunter

The Susquehanna River at Harrisburg 1897-1938

Common Loon, *Gavia immer immer*	1
Horned Grebe, *Colymbus auritus*	2
Whistling Swan, *Cygnus columbianus*	16
Canada Goose, *Branta canadensis canadensis*	85
Snow Goose, *Chen hyperborea*	8
American Brant, *Branta bernicla hrota*	9
Common Mallard, *Anas platyrhynchos platyrhynchos*	
Black Duck, *Anas rubripes tristis*	909
Gadwall, *Chaulelasmus streperus*	81
European Widgeon, *Mareca penelope*	3
Baldpate, *Mareca americana*	269
American Pintail, *Dafila acuta tzitzihoa*	902
'Teal,' *Nettion carolinense* and *Querquedula discors*	189
Shoveller, *Spatula clypeata*	21
Wood Duck, *Aix sponsa*	25
Redhead, *Nyroca americana*	639
Ring-necked Duck, *Nyroca collaris*	100
Canvas-back, *Nyroca valisineria*	413
Greater Scaup Duck, *Nyroca marila*	1751
Lesser Scaup Duck, *Nyroca affinis*	196
American Golden-eye, *Vlaucionetta clangula americana*	274
Buffle-head, *Charitonetta albeola*	503
King Eider, *Somateria spectabilis*	9
White-winged Scoter, *Melanitta deglandi*	336
Surf Scoter, *Melanitta perspicillata*	1
Ruddy Duck, *Erismatura jamaicensis rubida*	680
Merganser, *Mergus sp. ?*	214
American Coot, *Fulica americana americana*	16

Reprinted from *The Auk*, Vol. 61, July, 1944, the above is from a paper by Dr. Harold B. Wood, physician and ornithologist. Taken from records kept by Mr. Hardie Disney, a professional duck hunter, it gives us additional knowledge as to the value of the Susquehanna River as a flight-lane.

Everyone at all interested in waterfowl should read the complete paper by Dr. Wood.

Analysis and Discussion

To ascertain the reasons for the variety of waterfowl utilizing the Susquehanna River we must look to both the waterfowl themselves as well as to the river, and question not only its physical condition but its geographical location as well.

An examination of the Susquehanna River, and several of its tributaries, relative to waterfowl food content was made at various times during the late summer of 1949 at various localities from Williamsport to Washington Boro (below Harrisburg). District Game Protectors Morningstar, Ganster, and Eicholtz assisted in this survey. Dr. A. C. Martin, of the United States Fish and Wildlife Service assisted in the identification of certain plants taken from the river.

The survey showed that the grassy islands found in the Susquehanna are composed, for the most part, of three-square (*Scirpus americanus*). In some few localities small stands of water-willow (*Dianthera americana*) were noted. This vegetation (*Scirpus*) is especially noticeable just upstream from Harrisburg, although it persists in other localities in the river. In some places, such as one that was noted along the west bank at a point south of the mouth of the Conodoguinet Creek, several broods of mallards were noted utilizing the beds that were located out of the main current. No doubt the algae and lack of current furnished food and cover.

Wild celery (*Vallisneria americana*) as well as sago pondweed (*Potamogeton pectinatus*), duck potato (*Sagittaria*), coontail (*Ceratophyllum*), curly-leaved pondweed (*P. crispus*), and other potamogetons of the Illinoensis group were found in the Susquehanna immediately north of Harrisburg. In certain parts of this stretch, especially the upper part, untold thousands of snails (*Planorbis*) were found.

Conodoguinet Creek, emptying into the Susquehanna from the west at a point just north of Harrisburg, also produces an abundance of waterfowl food. Penn's Creek, flowing into the Susquehanna from the west at a point below Selinsgrove, was found to contain much waterfowl food, especially wild celery.

On the other hand, Conewago Creek, emptying into the Susquehanna from the west at a point south of Harrisburg, contained no visible waterfowl food; all that was noted were stands of water willow (*Dianthera*).

Celery, in small amounts, was also noted in the Williamsport region as well as at Wyalusing.

After breaking through Blue Moutain above Harrisburg, the Susquehanna River is spanned by several power dams. Safe Harbor Dam, located downstream from Columbia, is the first large dam in the river with Lancaster County for its eastern terminus and York County for its western terminus. Located in excellent farm country, it is logical to assume that waterfowl utilizing the quiet waters upstream from this dam would also feed on corn wasted by cornpickers of the farmers. According to District Game Protector Eicholtz, black ducks and mallards have learned to do this.

Two large power dams in the Susquehanna below Safe Harbor are apparently not utilized to any great extent by waterfowl. These dams are the Holtwood and the Conowingo. The former is located in Pennsylvania, as is Safe Harbor, but the Conowingo is located in Maryland although it does back water well into Pennsylvania.

The geographical location of the Susquehanna River is such that it presents an excellent water route from Chesapeake Bay to the Finger Lakes region, as well as to the Great Lakes system, and so on to the west and northwest part of the country. So it is, that certain of the genus *Nyroca*, such as the greater and lesser scaup, the redhead, and the canvasback, that nest in the northwest find this route to their liking, especially with the abundance of waterfowl food present. Others, such as the pintail, the black, and the mallard, also find it convenient to utilize this broad avenue of travel.

Table 2

Returns Taken in Pennsylvania as of October 14, 1949

According to Species and State in which Banded

	Mich.	*N.Y.*	*Ohio*	*N.J.*	*N.C.*	*Ont.*	*S.C.*	*Vt.*	*N.D.*	*Me.*	*Mass.*	*Minn.*	*Man.*	*Alta.*	*Sask.*	*Md.*	*Ill.*	*Va.*	*Total*
Mallard	4	2	1	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	8
Black	7	19	.	3	1	7	4	1	..	1	..	.	.	..	.	.	1	1	45
Bald.	..	.						.	1	..	..	..	..	..	..	..	..	..	1
Shoveller	..	..					.	..	1	..	..	..	..	..	..	..	..	..	1
Wood	..	3			..	..	..	2	..	2	1	..	..	..	..	..	..	..	8
Redhead	..	..		..	..	..	..	..	..	..	.	1	3	..	..	..	..	..	4
G. Scaup	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	1
L. Scaup	..	..			.	1	2	..	1	..	..	..	..	1	1	..	..	..	6
Ringneck	..	..	.	..	..	.	1	..	..	..	..	..	..	..	..	..	..	..	1
Bufflehead	..	..	.	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	2
Canada Goose	..	..	..	1	4	..	..	..	..	..	..	..	..	..	..	1	..	..	6
Pintail	..	..	..	.	..	..	..	..	1	..	..	..	..	..	..	..	..	..	1
Totals	11	24	1	4	5	8	8	3	4	3	1	1	5	1	1	1	2	1	84

TABLE 2A

Table of Ratios of Mallard and Black Duck Returns

(as of September 30, 1948)

MALLARD

State or Province in which Banded	*No. Returns From Penna.*	*Total No. Returns From all States*	*Ratio*
Michigan	4	1466	1:366
New York	2	345	1:173
Ohio	1	140	1:140
Totals	7	1951	1:279 (Av.)

BLACK DUCK

Michigan	6	2332	1:389
New Jersey	3	124	1:41
New York	15	2363	1:158
North Carolina	1	113	1:113
Ontario	7	1037	1:148
South Carolina	4	130	1:32
Vermont	1	44	1:44
Totals	37	6143	1:166 (Av.)

Waterfowl Banded Outside, Taken in Pennsylvania

Table 2, Table 2a, as well as *Map II* are each a part of this particular phase of the study. Sixty-six (66) returns of this category were obtained by searching the files of the Patuxent Wildlife Research Refuge in June 1948. Since that time an additional 18 returns of the same category have been received by the author from Patuxent. This is in accordance with a new policy recently adopted by the Fish and Wildlife Service whereby not only the bander and the taker are notified of a return, but also the individual holding the Master Banding Permit in the state wherein the band is taken.

Table 2 is the result of analyzing 85,732 returns on file at Patuxent and segregating those taken in Pennsylvania. The 18 latest returns mentioned above are also recorded therein but not in *Table 2a* because the *total* number of returns between June 1948 and October 1949 is not known.

The date of October 14, 1949 appearing on *Tables 2,* and *Map II* indicates that the returns thereon include all returns of this particular category up to and including a notification from Patuxent dated, "Laurel, Maryland, October 14, 1949"; such notification appearing on form 3-624 (revised) 48; 37706. It so happens that band No. 37-622754 is the band of the October 14, 1949 date. In other words, anything in the files of the Fish and Wildlife Service bearing their date subsequent to October 14, 1949 is neither tabulated nor mapped in this paper.

The numbers appearing on *Map II* do not signify quantity, but key the map to its explanatory *Table 2.*

Analysis and Discussion

From *Table 2* it can be seen that 12 species of waterfowl banded outside the state have been taken in Pennsylvania. These have been banded in 18 states and provinces, with New York apparently leading in importance.

Inasmuch as the states have banded a varying number of waterfowl, which activity has resulted in a varied number of returns, the "Ratio" figures in the last column of *Table 2a* is an effort to show just how important the various states really are in furnishing ducks to Pennsylvania. It is apparent that use of this latter table has certain limitations. It should be noted that, as has been previously mentioned, this table is based on figures obtained while at Patuxent in June 1948. As such it is derived from the 66 returns gleaned from the 85,732 returns examined.

An examination of *Map II* reveals many obvious features, particularly areas where take is heavier. These include the Erie Bay region, the Pymatuning-Conneaut Marsh region, the Susquehanna River, the Reading Reservoir region, and the lower Delaware River.

It is interesting to note that more banded ducks are taken in the southwestern part of the state than are taken in the lake region of the glaciated northeastern portion. The direct returns from wood ducks emanating from Maine, Massachusetts, Vermont, and New York are of interest and the take of South Carolina black ducks, although indirect, should be noted.

TABLE 3

Waterfowl Banded At Pymatuning Spring 1938 and Spring 1939

(Return as of December 31, 1949) * *

	Number Banded According To Year and Sex							
	1938			*1939*				*Tot. Band Returns*
	M.	*F.*	*?*	*M.*	*F.*	*?*		
Mallard, *Anas platy.*	49	25	..	72	31	..	177	23 (12.9%)
Black Duck, *Anas rubripes*	100	27	14	93	46	..	280	40 (14.2%)
Am. Coot, *Fulica americana*			50	..	..	147	197	10 (5.0%)
Lesser Scaup, *Nyroca affinis*	7	2	.	126	44	..	179	16 (8.9%)
Baldpate, *Mareca americana*	9	3	1	14	2	..	29	2 (6.8%)
Ring-necked, *Nyroca collaris*	7	5	..	8	2	..	22	4 (18.1%)
Pintail, *Dafila acuta t.*	4	3	..	..	1	..	8	1
Redhead, *Nyroca americana*	7	4	..	..	1	..	12	1
Wood Duck, *Aix sponsa*	34	13	.	19	6	..	72	1
Canvasback, *Nyroca vallisneria*	..	..	..	1	..	..	1	1
Greater Scaup, *Nyroca marila*	..	..	.	3	..	..	3	.
Blue-w. Teal, *Querquedula discors*		..	.	2		..	2	.
Green-w. Teal *Nettion carolinensis*	2	..			1	..	3	..
Totals	219	82	65	338	134	147	*985*	99 (11.2%) *
		366			619			
				985				

* Average percent return disregarding coot.

** All data taken from the files of the United States Fish and Wildlife Service's Patuxent Wildlife Research Refuge, Section of Distribution and Migration of Birds.

Waterfowl Banded at Pymatuning, Spring 1938 and Spring 1939

Table 3, Table 3a and *Table 3b*, as well as *Map III* are each a part of this particular phase of study.

The Pymatuning Reservoir is located in Crawford County, Pennsylvania, and Ashtabula County, Ohio, and is impounded on what was formerly the Pymatuning Swamp on the Shenango River.

There are two dams involved in the project. The construction of the main dam at Jamestown, Pennsylvania was begun on October 6, 1931. The gate of the upper dam at Linesville. Pennsylvania was closed on December 5, 1933 and that of the lower or main dam on January 23, 1934.

There are approximately 14,500 acres of impounded water behind the main dam, and approximately 2,500 surface-acres behind the upper dam. It is this latter reservoir, along with approximately 1,200 acres of surrounding land, that comprises the Pymatuning Refuge. The main reservoir, having been built for purpose of stabilizing the flow of the Shenango River, is subject to water level fluctuation and, because of this, the lake has assumed the appearance typical of that type reservoir. Given over to recreation, the main reservoir is more nearly desirable for shore birds than for ducks since there are few aquatic plants present, and since the area is open to gunning.

The water level above the secondary dam at Linesville is relatively stable and is not directly affected by drawdown on the main reservoir. In 1940, Trimble reported that the most startling development in connection with the new refuge was the increase in number of certain species utilizing the area for nesting, as well as the presence of certain nesting ducks never known to have nested in the region previously. Among the nesting species found were: gadwall, baldpate, pintail, green-winged teal, shoveller, redhead, ringnecked, and ruddy; the mallard, and black, nested in great numbers.

The reasons for the establishment of nesting by such unusual species as the redhead, ringnecked duck, and ruddy are not exactly clear in view of the fact that we know that these species do not readily "pioneer". Various explanations, such as drought on the normal breeding grounds, have been advanced. It would seem more likely that conditions were so correct on the new refuge that nesting was inevitable.

It would seem reasonable that such man-made conditions could have been maintained. Such has not been the case at Pymatuning. Within a few years, wave action and carp, causing turbidity and a subsequent elimination of sunlight required for submerged waterfowl food were more than the vegetation could bear. On the marginal ground other gradual changes went on until natural succession toward the climax, aided by a reforestation project of the earlier days, gradually supplanted the waterfowl nesting cover which had consisted mostly of abandoned weedy fields and grasses.

Such then is a brief description of the Pymatuning Refuge. While conditions are not optimum for nesting and feeding, nevertheless the area today does serve as a refuge and resting ground. Much food is ob-

tained from wastages of surrounding agriculture, particularly combined and picked fields. In addition to the above sources of food, wheat, corn, and buckwheat are raised on the refuge by the Pennsylvania Game Commission for the sole benefit of migrating ducks and geese. For the past several years, experiments have been carried on whereby water levels have been lowered in the spring in an attempt to promote growth of waterfowl food plants.

In the meantime, the progeny of thirty pinioned Canadian geese, installed on the refuge on August 27, 1936, as well as an additional 30 released on October 3, 1938, are established in their nesting habits both in the refuge and in certain suitable places in the surrounding region.

TABLE 3A

Distribution of Mallard, Black Duck and Lesser Scaup Returns from the Spring 1938 and Spring 1939 Bandings at Pymatuning

(as of Dec. 31, 1949)

	Mallard		*Black Duck*		*Lesser Scaup*		
Province or State	*First Yr.*	*Later*	*First Yr.*	*Later*	*First Yr.*	*Later*	*Totals*
Louisiana	..	1	..	..	1	..	2
Minnesota	..	1	..	..	1	2	4
Saskatchewan	1	1	..	..	..	..	2
Pennsylvania	1	..	2	4	..	..	7
Tennessee	2	..	..	1	..	..	3
Illinois	..	1	2	..	..	..	3
South Carolina	1	..	1	4	..	..	6
Ohio	..	2	1	1	..	..	4
Ontario	2	1	1	6	1	..	11
Wisconsin	1	1	2	..	..	1	5
South Dakota	1	..	..	..	..	..	1
Michigan	1	1	2	1	1	..	6
Maryland	1	..	..	1	1	2	5
Indiana	..	1	..	..	..	..	1
Florida	..	1	..	..	2	1	4
Arkansas	..	1	..	..	..	..	1
Quebec	..	..	2	..	..	..	2
New York	..	..	..	1	..	1	2
Georgia	..	..	1	..	..	..	1
Mississippi	..	..	..	1	..	..	1
North Carolina	..	..	..	1	..	..	1
West Virginia	..	..	1	..	..	..	1
Manitoba	..	..	..	1	1	..	2
Virginia	..	..	..	2	..	..	2
Kentucky	..	..	..	1	..	..	1
Alberta	..	..	..	..	1	..	1
Totals	11	12	15	25	9	7	79
	23		40		16		
			79				

Table 3b

Individual Returns from Spring 1938 and Spring 1939 Bandings at Pymatuning

(as of Dec. 31, 1949)

Mallard Returns (banded 1938)

Total Banded 1938	*Band Number*	*Date Banded*	*Date Taken*	*Sex*	*Where Taken*
74	38-711471	4-3-38	12-3-44	F	Violet, La.
	38-636579	4-6-38	11-11-43	M	Minn., Minn.
	38-636591	4-6-38	5-4-40	M	Meadow Lake, Sask.
	38-713002	4-8-38	5-8-38	F	Pymatuning (found dead)
	38-713012	4-9-38	12-4-38	M	Ashland City, Tenn.
	38-636387	4-26-38	10-28-41	M	Chillecothe, Ill.

Mallard Returns (banded 1939)

103	38-636280	3-20-39	12-39	M	Georgetown, S. C.
	38-636287	3-20-39	11-30-40	F	Ashtabula, Ohio
	38-713208	3-22-39	10-9-39	M	Iriquois, Ontario
	38-713226	3-25-39	2-10-40	M	Seviorville, Tenn.
	38-644292	3-26-39	11-42	F	Erie Co., Ohio
	38-636416	3-30-39	11-9-42	F	Hamilton, Ontario
	38-636421	3-31-39	11-2-39	M	Zittaw, Wisc.
	38-713238	4-2-39	9-2-39	M	Mitchellton, Sask.
	38-636451	4-4-39	11-8-39	M	Roberts Co., S. D.
	38-636465	4-9-39	fall, '42	M	Livingstone Co., Mich.
	38-713266	4-10-39	12-16-39	M	Oldtown, Md.
	38-636475	4-11-39	Oct. '39	F	Windsor, Ontario
	38-636496	4-17-39	12-21-45	M	Ft. Wayne, Indiana
	37-629580	4-26-39	11-24-40	M	St. James Island, Fla.
	37-629513	4-23-39	10-21-39	M	Monroe, Michigan
	38-644116	5-1-39	11-18-40	M	Gillet, Arkansas
	38-644188	5-3-39	11-6-40	M	Marshal, Wisconsin

Black Duck Returns (banded 1938)

141	38-711402	3-25-38	12-11-38	?	Montreal, Quebec
	38-711421	3-28-38	10-7-38	M	Sturgis, Michigan
	38-711452	3-31-38	11-26-39	M	Suffolk Co., L. I., N. Y.
	38-711458	4-1-38	10-14-38	M	Ford Island, Wisconsin
	38-711465	4-2-38	12-11-38	M	Conneautville, Pa.
	38-711468	4-2-38	12-26-38	F	Darien, Georgia
	38-636553	4-3-38	10-1938	F	Lake St. John, Quebec
	38-711473	4-3-38	Fall, '40	M	Pecan, Miss.
	38-711483	4-3-38	10-12-38	M	Lake St. Clair, Mich.
	38-711488	4-3-38	12-1940	M	Mattamuskeet, N. C.
	38-636565	4-4-38	Fall, '40	F	St. Helena Sound, S. C.
	38-636321	4-9-38	10-23-38	M	Elkins, W. Va.
	38-636324	4-9-38	11-5-38	F	Muskegon, Mich.
	38-713007	4-9-38	10-21-39	M	Churchill, Manitoba
	38-713009	4-9-38	3-13-44	M	Georgetown, S. C.
	38-713024	4-13-38	11-11-40	M	Edisto River, S. C.
	38-636348	4-18-38	9-16-40	M	Coldwater, Ontario
	38-636349	4-18-38	12-4-40	M	Randolph, Va.
	38-713039	4-21-38	10-18-41	?	Hartstown, Pa.
	38-636383	4-26-38	12-17-44	F	Geneva, Pa.

TABLE 3B (cont'd)

Individual Returns from Spring 1938 and Spring 1939 Bandings at Pymatuning

Black Duck Returns (banded 1939)

Total Banded	Band Number	Date Banded	Date Taken	Sex	Where Taken
139	38-636228	3-20-39	9-9-42	M	North Bay, Ontario
	38-636252	3-20-39	11-3-41	M	Romney Ck., Aberdeen, Md.
	38-644243	3-21-39	Fall, '39	M	Norwich, Ontario
	38-713211	3-23-39	11-15-40	M	Mahoning Co., Ohio
	38-644284	3-23-39	11-21-40	F	Pymatuning area, Pa.
	38-713225	3-25-39	10-3-40	M	Long Pt., Ontario
	38-713227	3-25-39	11-1939	F	East Harbor, Ohio
	38-636404	4-2-39	5-11-43	M	Almonte, Ontario
	38-636425	4-2-39	Fall, '39	F	Eagle River, Wisc.
	38-713242	4-3-39	11-15-40	M	Pt. Rowan, Ontario
	38-713250	4-6-39	12-1942	M	Emory, Virginia
	38-636458	4-8-39	11-15-39	M	Wonder Lake, Illinois
	38-636459	4-8-39	11-15-39	M	65 miles W. Chicago
	38-713257	4-9-39	7-1942	M	Moose Factory, Ontario
	38-713259	4-9-39	11-1939	M	Georgetown, S. C.
	38-713262	4-9-39	12-19-45	M	Louisville, Ky.
	38-713270	4-11-39	11-6-40	M	Reelfoot Lake, Tenn.
	38-713280	4-12-39	12-3-44	M	Georgetown, S. C.
	37-629568	4-18-39	11-17-41	F	Pettis Swamp, Craw. Co., Pa.
	38-636499	4-18-39	12-1-39	F	Pymatuning area, Pa.

American Coot Returns (banded 1938)

50	38-523601	3-23-38	10-13-38	—	Hustiford, Wisconsin
	38-523609	3-25-38	10-1-39		Hennepin Co., Minn.
	38-636562	4-4-38	1-29-39		Orange Lake, Florida
	38-636351	4-18-38	9-19-38		Valleyfield, Quebec

American Coot Returns (banded 1939)

147	38-636214	3-19-39	10-1-39	—	Bow String River, Minn.
	38-636229	3-20-39	10-1-39		W. Bend, Wisconsin
	38-636242	3-20-39	9-15-41		Lake of Woods, Ontario
	38-636244	3-20-39	3-21-39		Pymatuning (dead)
	38-636249	3-20-39	10-1-39		Waterford, Wisconsin

Lesser Scaup Returns (banded 1938)

9 No returns

Lesser Scaup Returns (banded 1939)

170	38-636446	4-3-39	11-3-42	M	Sauk Center, Minn.
	37-629553	4-24-39	11-22-39	M	Belmont Bay, Md.
	37-629549	4-24-39	9-12-39	M	Lac La Biche, Alberta
	37-629576	4-25-39	Fall, '40	M	E. Bay, Md.
	37-629577	4-25-39	10-1-39	F	Presque I. Co., Mich.
	38-644122	5-1-39	9-22-39	F	Rockwood, Minn.
	38-644125	5-1-39	12-5-39	M	Cocoa, Florida
	38-644140	5-1-39	12-1939	M	Allen Parish, La.
	38-644152	5-1-39	12-29-40	M	Sanford, Florida
	38-644147	5-2-39	10-15-39	F	Leeds Co., Ontario
	38-644165	5-2-39	10-16-41	M	Buffalo, N. Y.
	38-644169	5-2-39	10-27-40	F	Lake Ida, Minn.
	38-644175	5-2-39	5-17-39	M	Loon Lake, Manitoba
	38-644178	5-2-39	10-1942	F	Green Bay, Wisconsin
	37-629711	5-8-39	Fall, '40	M	Chestertown, Md.
	37-629708	5-8-39	12-9-39	M	Seminole Co., Fla.

TABLE 3B (cont'd)

Individual Returns from Spring 1938 and Spring 1939 Bandings at Pymatuning

Baldpate Returns (banded 1938)

Total	Band Banded Number	Date Banded	Date Taken	Sex	Where Taken
13	38-636518	3-25-38	April '42	M	Santa Domingo

Baldpate Returns (banded 1939)

16	38-644203	3-20-39	Fall, '40	M	Sachigo River, Ontario

Ring-necked Duck Returns (banded 1938)

12	38-636326	4-11-38	11-25-38	M	Knotts Island, N. C.
	38-636333	4-12-38	10-29-38	F	St. Wms. Ontario

Ring-necked Duck Returns (banded 1939)

10	38-636430	4-2-39	5-1-39	M	Orillia, Ontario
	38-644288	3-25-39	11-1939	M	Caredo, W. Va.

Pintail Returns (banded 1938)

7	38-636515	3-25-38	11-8-38	M	Bono, Ohio

Pintail Returns (banded 1939)

1 No returns

Redhead Returns (banded 1938)

11	38-636542	3-31-38	11-7-40	M	Clinton, Iowa

Redhead Returns (banded 1939)

1 No returns

Wood Duck Returns (banded 1938)

47	38-636378	4-25-38	1-25-40	M	Sheffield, Alabama

Wood Duck Returns (banded 1939)

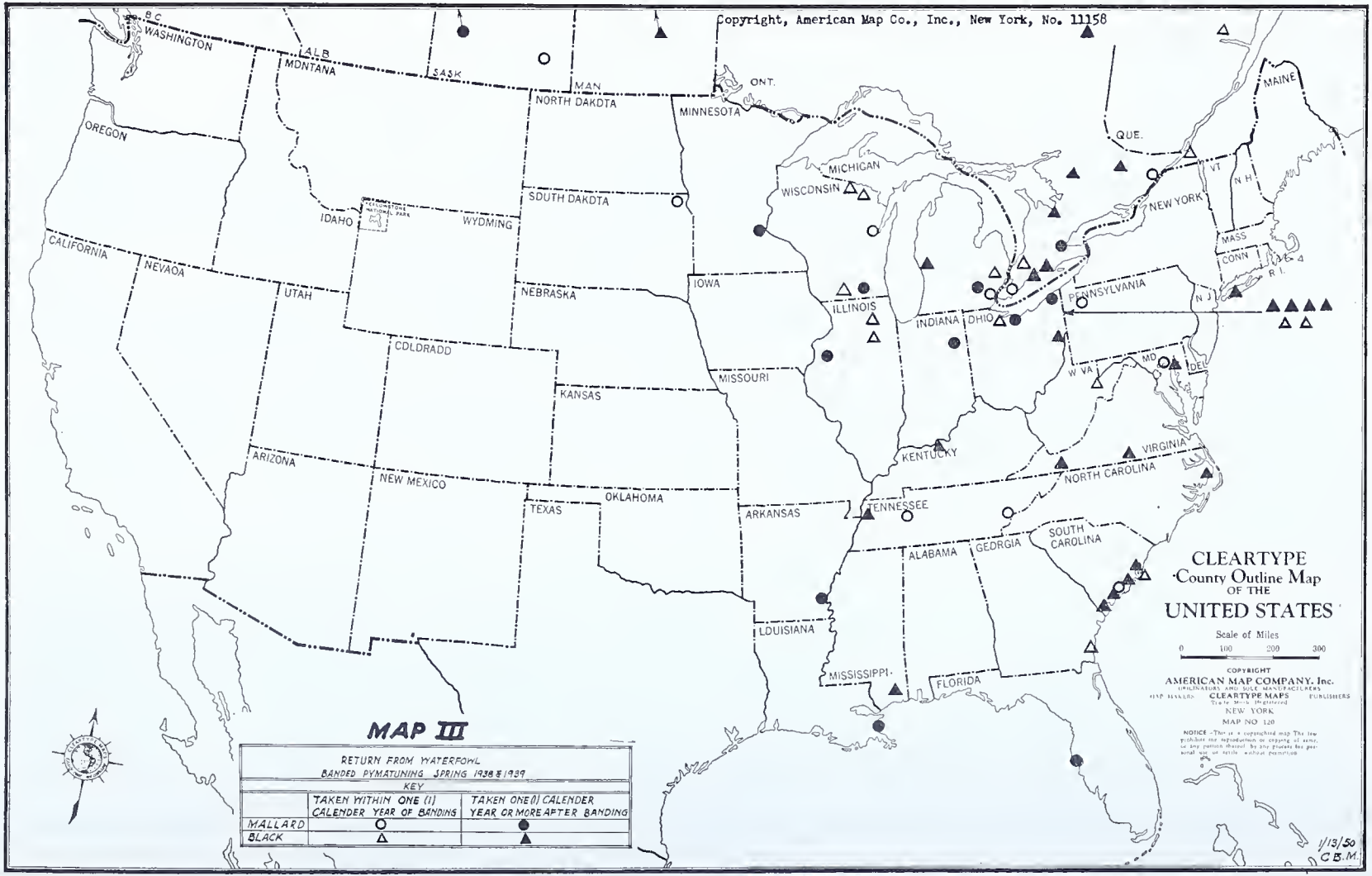
25 No returns

Canvasback

1	37-629572	4-25-39	10-25-39	M	Detroit River, Mich.

Analysis and Discussion

The data forming the basis for this segment of this report were all obtained by the writer from the files of the Fish and Wildlife Service's Patuxent Wildlife Research Refuge in May-June 1948. These files show that ducks were trapped and banded from March 24 to May 5 (inclusive) 1938 and from March 19 to May 16 (inclusive) 1939.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B.C.
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MINNESOTA
MAINE
QUE.
OREGON
MICHIGAN
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VT
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NEW YORK
SOUTH DAKOTA
IDAHO
YELLOWSTONE NATIONAL PARK
WYOMING
MASS
CONN
R.I.
CALIFORNIA
NEVADA
UTAH
IOWA
NEBRASKA
ILLINOIS
PENNSYLVANIA
N J
INDIANA
OHIO
COLORADO
MD
DEL
W VA
MISSOURI
KANSAS
KENTUCKY
VIRGINIA
ARIZONA
NEW MEXICO
OKLAHOMA
TEXAS
ARKANSAS
TENNESSEE
NORTH CAROLINA
SOUTH CAROLINA
ALABAMA
GEORGIA
LOUISIANA
MISSISSIPPI
FLORIDA
MAP III
RETURN FROM WATERFOWL
BANDED PYMATUNING SPRING 1938 & 1939
KEY
TAKEN WITHIN ONE (1) CALENDER YEAR OF BANDING
TAKEN ONE(1) CALENDER YEAR OR MORE AFTER BANDING
MALLARD
BLACK
CLEARTYPE
County Outline Map
OF THE
UNITED STATES
Scale of Miles
0 100 200 300
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C.B.M.

From *Table 3a* it is evident that 26 states (including Pennsylvania) and provinces shared in the taking of the mallards, blacks, and lesser scaups. Ontario led in numbers taken.

The mallard and black duck returns are depicted on *Map III*. It may easily be seen that the mallards remain inland and follow the Mississippi Flyway for the most part, while the black ducks have a tendency to break through to the Atlantic Coast, usually in South Carolina.

Although not mapped, the lesser scaup returns from these bandings show a drift from Pymatuning in an extreme northwest-southeast direction. Three returns are from Florida, three from Maryland, three from Minnesota, one each fom Alberta and Manitoba. Coot returns indicate essentially the same course.

It should also be noted that of the mallard, black duck, and lesser scaup returns shown on *Table 3a,* 35 were taken within one year of banding while 44 were taken after the elapse of at least one year of banding.

Waterfowl Banded at Pymatuning, Fall 1948

Table 4, Table 4a, Table 4b, as well as *Map IV* are each a part of this particular phase of study.

During the forepart of August 1948, an estimated 3,000-3,500 blacks and mallards were observed at the Pymatuning Refuge. These ducks began leaving the refuge, both morning and evening, to feed in the surrounding combined fields lying to the south and west of the refuge. Whether these ducks were locally-raised ducks from the Conneaut-Hartstown-Adamsville-Pymatuning marsh region, or whether they were premigratory transients was not ascertained. All early attempts to trap and band these ducks ended in failure and it was not until October 30, 1948 that the first ducks were trapped.

All ducks were taken either on the north and south side of Ford Island or on the east side of the refuge on the terminus of Corduroy Road. Shelled corn was used for bait.

Analysis and Discussion

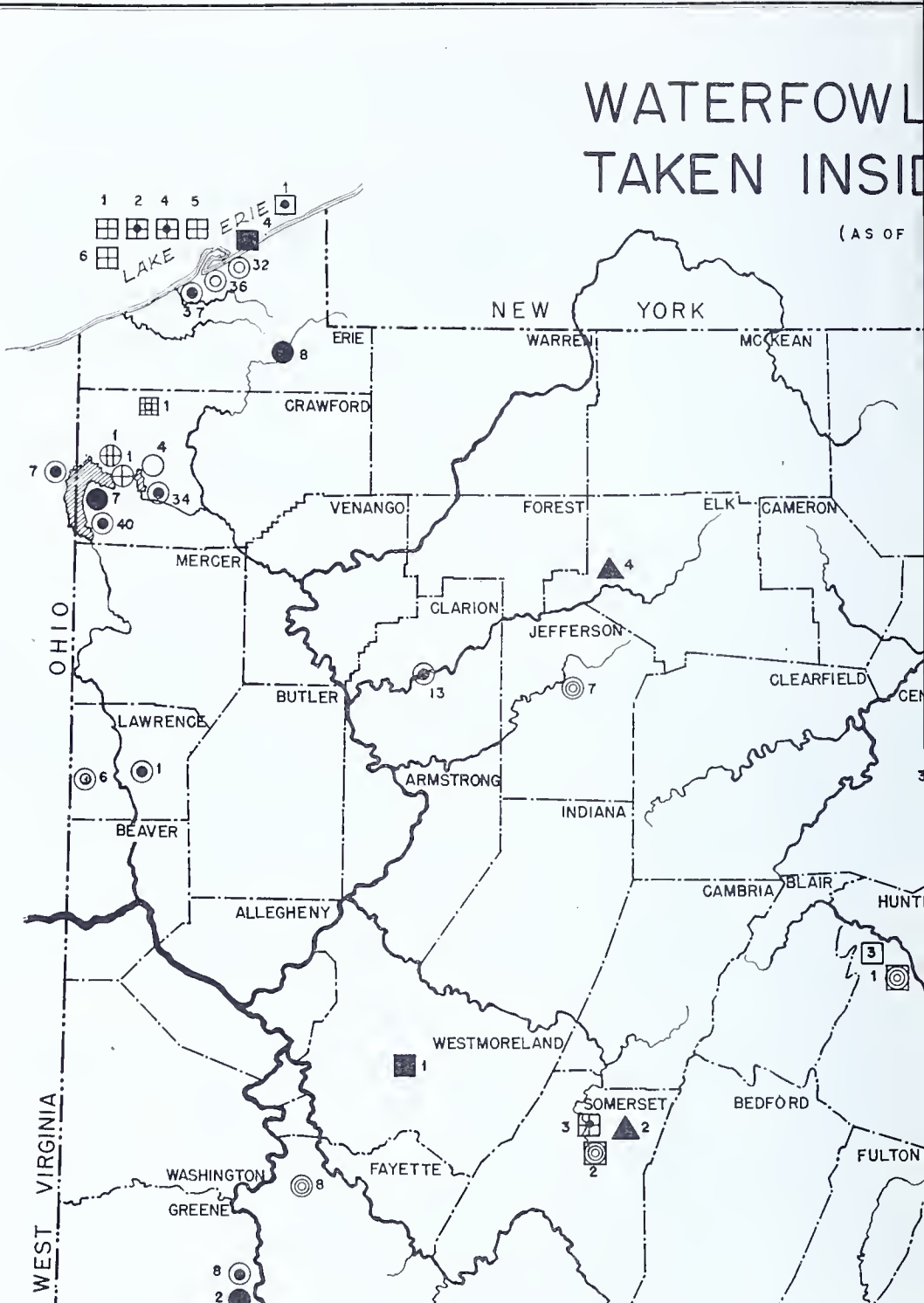
It is believed that, for the most part, the meaning of the various *Tables* and *Maps* comprising this segment of study is self-evident without lengthy explanation.

At the moment, the most important feature to observe is the location of take of the banded ducks reported. Examining *Map IV,* we are interested in seeing the number of ducks taken south and west of the refuge—in Ohio, on the lower Mississippi drainage, and in South Carolina. Almost all of these are direct returns, taken so soon after banding (see Table 4b), we may conclude that the route taken by the individual from the site of banding to the site of taking was direct.

On the basis of these rather limited returns from rather limited fall bandings we conclude that:

(1) Mallard and black ducks visiting the Pymatuning Refuge in the fall of 1948 were essentially Mississippi Flyway birds.

(2) Those mallards and blacks travelling via the Atlantic Flyway did so far south—South Carolina, to be exact.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CLEARFIELD
OHIO
BUTLER
LAWRENCE
ARMSTRONG
INDIANA
BEAVER
CAMBRIA
BLAIR
ALLEGHENY
WESTMORELAND
SOMERSET
BEDFORD
FULTON
WASHINGTON
FAYETTE
GREENE
WEST VIRGINIA
W. VA.
(NUMBERS INDICATE SOURC

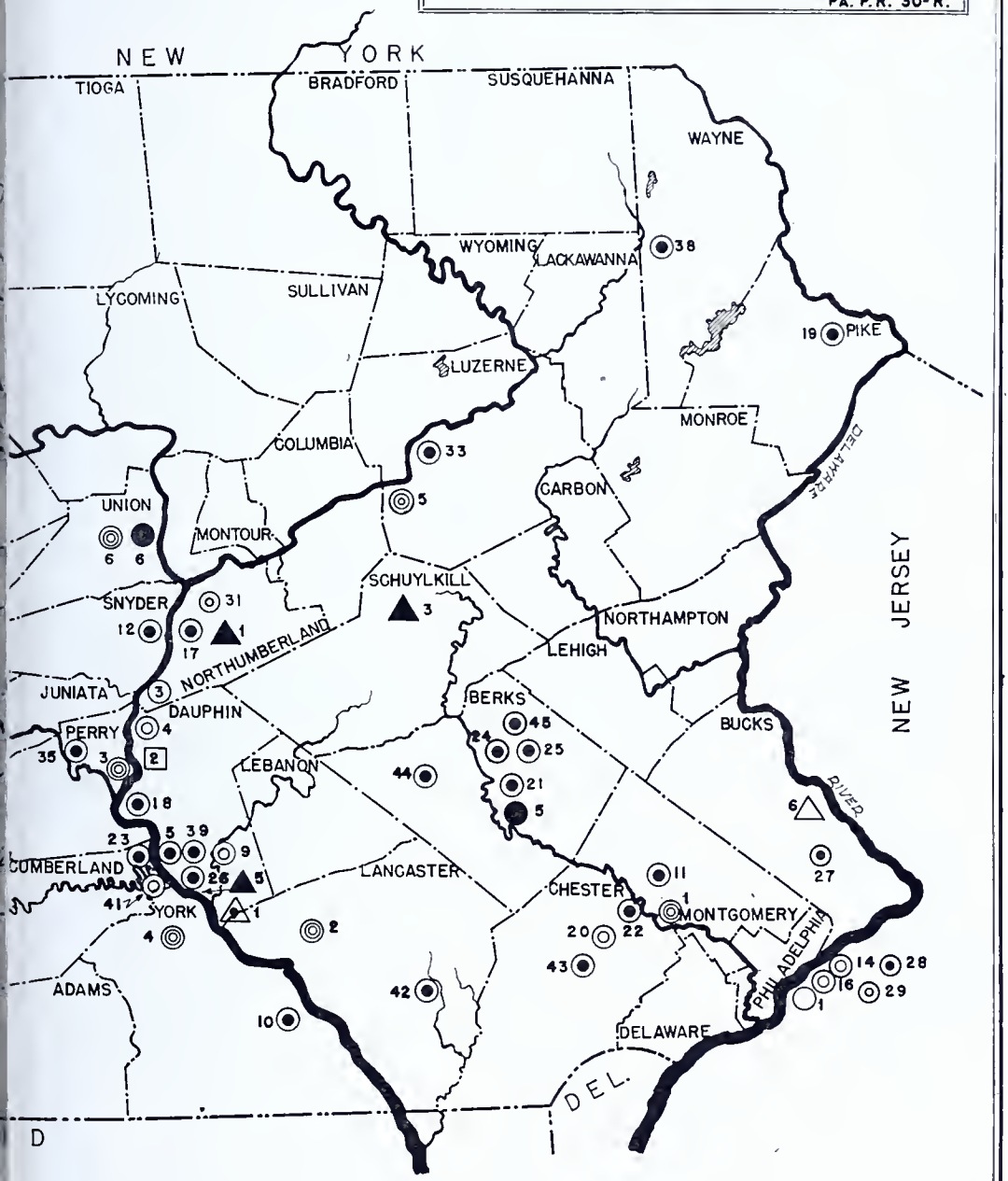
ED OUTSIDE,
NNSYLVANIA

)

KEY

NAME	DIRECT RETURN	INDIRECT RETURN	NAME	DIRECT RETURN	INDIRECT RETURN
MALLARD	○	●	GR. SCAUP	⊙	⊙
BLACK	◎	◉	L. SCAUP	⊞	⊞
BALDPATE	⊕	⊕	R. NECKED	⊞	⊞
SHOVELLER	⊕	⊕	BUFFLEHEAD	◎	◎
WOOD	◎	◎	CANADA G.	△	▲
REDHEAD	□	■	PINTAIL	△	△

PA. P.R. 30-R.



EE TABLE 2)

L.A.M. '49

Table 4

Waterfowl Banded at Pymatuning, Fall 1948

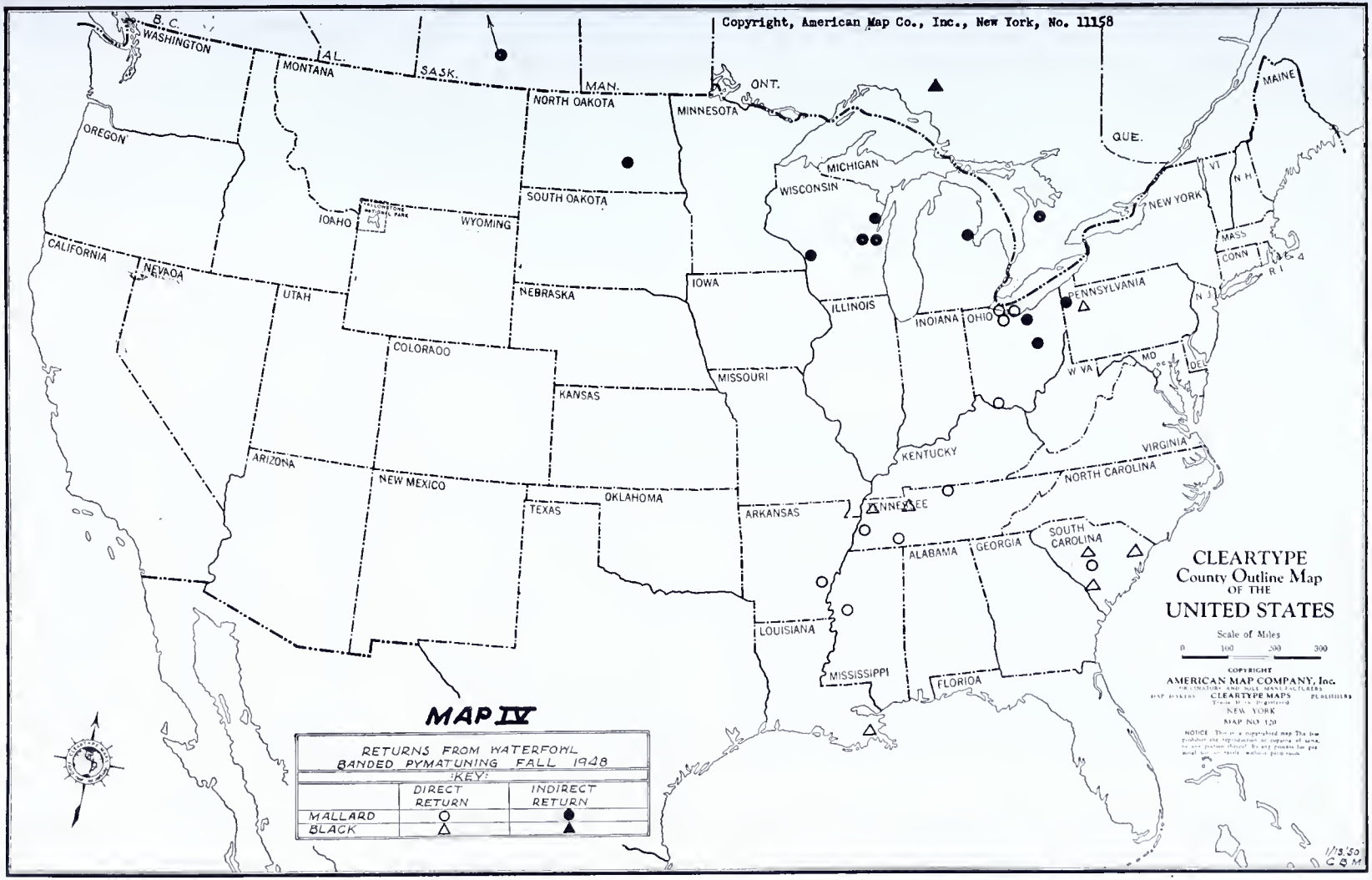
Date Banded	*Number Banded*	*Mallards*	*Black Duck*	*Pintail*	*Mallard-black Hybrid*
10-30	36	10	25	1	..
11-4	41	4	35	..	2
11-5	5	3	2	..	..
11-7	40	4	36	..	..
11-9	8	5	3	..	..
11-11	48	36	12	..	..
11-12	69	60	9	..	..
11-13	78	70	8	..	..
11-14	34	23	10	..	1
11-15	65	46	18	..	1
11-16	36	19	16	..	1
11-17	56	22	33	..	1
11-22	25	4	21	..	..
11-24	8	1	7	..	..
11-26	22	12	9	1	..
11-28	17	15	2	..	..
11-29	6	6	..	..	..
11-30	9	7	1	..	1
12-1	9	7	1	..	1
12-2	7	..	7	..	..
Totals	619	354	255	2	8
% Total	100%	57%	41%	.3%	1.2%

Table 4a

Distribution of Mallard and Black Duck Returns from the 1948 Pymatuning Banding Operations

(as of Dec. 31, 1949)

Province or State	*Mallard*		*Black Duck*		*Totals*
	Direct	*Indirect*	*Direct*	*Indirect*	
Ontario	..	1	..	1	2
Wisconsin	..	3	..	..	3
Pennsylvania	..	1	1	..	2
Michigan	..	1	..	..	1
Ohio	3	2	..	..	5
S. Carolina	1	..	3	..	4
Louisiana	.	..	1	..	1
Tennessee	3	..	2	..	5
Kentucky	1	..	..	..	1
Saskatchewan	..	1	..	..	1
Arkansas	1	..	..	..	1
North Dakota	..	1	..	..	1
Mississippi	1	..	..	..	1
Totals	10	10	7	1	28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B. C.
WASHINGTON
ALTA.
SASK.
MAN.
ONT.
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MONTANA
NORTH OAKOTA
MINNESOTA
MAINE
OREGON
MICHIGAN
WISCONSIN
VT
N H
NEW YORK
SOUTH OAKOTA
IDAHO
WYOMING
MASS
CONN
R I
CALIFORNIA
NEVADA
UTAH
NEBRASKA
IOWA
ILLINOIS
INDIANA
OHIO
PENNSYLVANIA
N J
COLORADO
MISSOURI
W VA
MD
DEL
KANSAS
KENTUCKY
VIRGINIA
ARIZONA
NEW MEXICO
OKLAHOMA
TEXAS
ARKANSAS
TENNESSEE
NORTH CAROLINA
SOUTH CAROLINA
ALABAMA
GEORGIA
LOUISIANA
MISSISSIPPI
FLORIDA
MAP IV
RETURNS FROM WATERFOWL
BANDED PYMATUNING FALL 1948
KEY:
DIRECT RETURN
INDIRECT RETURN
MALLARD
BLACK
CLEARTYPE
County Outline Map
OF THE
UNITED STATES
Scale of Miles
0 100 200 300
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TABLE 4B

Individual Returns from the 1948 Pymatuning Operations

Total Banded 1948	*Band Number*	*Date Banded*	*Date Taken*	*Sex*	*Age*	*Where Taken*
			Mallard (20)			
354	44-722126	11-9-48	12-28-48	M	Y	Halls, Tennessee
	44-722157	11-11-48	12-25-48	M	Y	Snake Creek, Tenn.
	44-722163	11-11-48	11-5-49	M	Y	Oshkosh, Wisc.
	44-722178	11-12-48	10-27-49	M	Y	Trempealeau, Wisc.
	44-722352	11-12-48	1-1-49	M	Y	Vanaburg, Ky.
	44-722364	11-12-48	10-14-49	F	Y	Oshkosh, Wisc.
	44-722386	11-12-48	10-22-49	M	Y	Linesville, Pa.
	44-722396	11-13-48	10-10-49	M	Y	Pinconning, Mich.
	44-722397	11-13-48	10-24-49	M	Y	Wayne Co., Ohio
	44-722421	11-13-48	8-22-49	F	Y	Waterhen Lake, Sask.
	44-722476	11-14-48	11-26-48	M	Y	Pt. Clinton, Ohio
	44-722477	11-14-48	12-18-48	M	Y	DeWitt, Ark.
	44-722511	11-15-48	10-9-49	M	Y	St. Michael, N. D.
	44-722512	11-15-48	10-22-49	M	Y	Lake Eugenia, Ont.
	44-722527	11-15-48	11-24-48	M	Y	Oak Harbor, Ohio
	44-722537	11-15-48	11-19-48	M	Y	Cedar Pt., Ohio
	44-722546	11-15-48	1-7-49	M	Y	Greenwood, Miss.
	44-722611	11-17-48	12-29-48	M	Y	Overton Co., Tenn.
	44-722702	11-26-48	1-4-49	M	Y	Saluda Co., S. C.
	44-722742	11-30-48	10-28-49	M	Y	Bono, Ohio
			Black Duck (8)			
255	44-722028	10-30-48	10-8-49	F	A	Hornepayne, Ont.
	44-722114	11-7-48	1-1-49	M	A	Fairfield Co., S. C.
	44-722118	11-7-48	12-22-48	M	Y	St. Bernard, La.
	44-722155	11-11-48	12-27-48	F	Y	Dover, Tenn.
	44-722502	11-14-48	12-26-48	M	Y	Paris, Tenn.
	44-722572	11-15-48	12-'48	M	Y	Crawford Co., Pa.
	44-722580	11-16-48	1-'49	M	A	South Carolina
	44-722766	12-2-48	1-27-49	M	A	Jackson, S. C.

NB:—All 3 of the black ducks reaching the Atlantic Coast were adult males; the only mallard doing this was a young male.

(3) The mallards and black ducks of the Pymatuning region have little or no connection with the mallards and black ducks of eastern Pennsylvania.

A comparison of *Map IV* with *Map III* is perhaps in order at this time. We find that the three conclusions above, based on *Map IV*, may be determined essentially from *Map III*. From *Map III*, despite its greater number of returns, it can be seen that the greater majority of returns is taken inland.

Waterfowl Banded at Pymatuning, Fall 1949

Table 5 and *Table 5a* are both a part of this particular phase of study. *Table 5a* pertains to both the 1948 and 1949 bandings and compares the sex ratios of waterfowl trapped during the two respective seasons.

After a late start (November) the first ducks were trapped on November 18. A new type of trap was utilized for the first time, the plans of which are a part of this report. (See *Figures 1 and 2*) Three traps were constructed, but for the most part only two were in use at any one time. Favored by weather, that alternately froze the shallows yet thawed at the correct time to hold an excellent population of ducks on the area, trapping results were sometimes amazing. (See *Table 5*)

Analysis and Discussion

No reason can be given for the reversal of percentage figures for the mallards and blacks trapped in 1949 as contrasted to 1948. (Check *Table 5* and *Table 4*)

A comparison of the sex ratios of both mallards and black ducks trapped during the fall of 1948 and the fall of 1949 shows a decline in the preponderance of males in both species. (See *Table 5a*)

As of December 31, 1949 no returns from these bandings have been received.

Table 5

Waterfowl Banded at Pymatuning, Fall 1949

(No returns as of Dec. 1949)

Date Banded	*Number Banded*	*Mallard*		*Black Duck*		*?*	*Pintail*		*Ringnecked*	
		Male	*Fem.*	*Male*	*Fem.*		*Male*	*Fem.*	*Male*	*Fem.*
11-18	27	3	..	..	..	24	..	..	..	..
11-23	60	18	20	12	10	..	..	..	..	..
11-28	23	6	3	..	..	14	..	..	..	..
11-30	65	9	14	28	14	.	.		..	
12-1	51	14	5	21	11	..	..	.	..	
12-2	27	28	16	42	11	..			.	
12-3	117	29	22	47	19	..	...	..	..	.
12-4	52	8	6	24	13	..	.	.	1	.
12-5	57	11	2	32	12	..	..		.	.
12-6	62	20	9	23	9	..	1		..	.
12-7	79	23	17	28	11	..	..	.	..	..
12-8	59	14	14	20	11	..	..		.	.
Totals	749	183	128	277	121	38	1		1	
		311			436		1		1	
% of Total	100%	41.5%		58.2%						

749
12-3-49 1 Female Mallard-Widgeon Hybrid

Grand Total 750

Table 6 is a part of this particular phase of study.

The Reading Reservoir Refuge, known as Maiden Creek Reservoir, and Lake Ontelaunee, is an artificial body of water built in 1926 by the City of Reading, Pennsylvania for water supply purposes. It has a surface acreage of 1085 acres and is located on Maiden Creek of the Schuylkill River. There is scarcely any vegetation in the reservoir. At times copper sulphate is used to destroy algae that does appear. The bulk of the area is closed to trespass and most of the land marginal to the water is in twenty-year-old conifers. The reservoir itself has considerable shallow water and an irregular shore-line. The surrounding country supports many fields of corn and wheat. Corn-pickers and combines are widely used in this area. The suitability of its position is further enhanced by its location between the lower Susquehanna and the lower Delaware rivers, and its proximity to both.

It was believed that waterfowl banded on this reservoir would give us information that could be of extreme importance, not only insofar as the lower Delaware and the lower Susquehanna rivers would be concerned, but relative to the region north of the Blue Mountain—the glaciated northeastern Pennsylvania lake country.

Early in March 1949 trapping began. The first duck was trapped on March 10, and trapping continued until May 30, by which time 464 ducks had been banded.

Analysis and Discussion

Since we have no reason to believe that either the traps or the methods used are selective between mallards and black ducks, we may assume that the black duck is the more common duck of this region.

TABLE 5A

A Comparison of Sex Ratios Between Waterfowl Banded at Pymatuning, Fall 1948 and Fall 1949, Respectively

	Mallard				*Black Duck*			
	Male	*Female*	*Ratio*		*Male*	*Female*	*Ratio*	
1948	254	100	2.5	1	202	53	3.8	1
1949	183	128	1.43	1	277	121	2.28	1

TABLE 6

Sex Ratios of Waterfowl Banded Reading Reservoir, Spring 1949

	Mallard				*Black Duck*			
	Male	*Female*	*Ratio*		*Male*	*Female*	*Ratio*	
March	2	0			59	45	1.31	1
April	14	6	2.33	1	146	127	1.15	1
May	9	6	1.5	1	31	16	1.94	1

TABLE 7

Sex Ratios of Waterfowl Banded Reading Reservoir, Fall 1949

	Mallard				*Black Duck*			
	Male	*Female*	*Ratio*		*Male*	*Female*	*Ratio*	
August	1	6	0.16	1	15	11	1.36	1
September	4	1	4.0	1	50	30	1.66	1
October	19	8	2.37	1	84	24	3.50	1

TABLE 7A

A Comparison of Sex Ratios Between Waterfowl Banded at Reading Reservoir, Spring 1949 and Fall 1949, Respectively

	Mallard				*Black Duck*			
	Male	*Female*	*Ratio*		*Male*	*Female*	*Ratio*	
Spring, 1949	25	12	2.08	1	236	188	1.25	1
Fall, 1949	24	15	1.60	1	149	65	2.3	1

Waterfowl Banded at Reading Reservoir, Fall 1949

Table 7 is a part of this particular phase of study. *Table 7a* is a comparison of sex ratios of waterfowl trapped in the spring of 1949 with those trapped in the fall of 1949 at the above locality.

Analysis and Discussion

There were no returns from the fall 1949 bandings at the time that this report was begun. *Table 7* is self-explanatory. *Table 7a* shows a decrease in preponderance of male mallards compared with female mallards from spring to fall, but an increase of male blacks as compared with female blacks from spring to fall.

Analysis and Comparison of the Results of Waterfowl Banding in Ohio, Michigan, Pennsylvania and Elsewhere

Quite often negative results are as important as positive ones. A knowledge of where Pennsylvania ducks are *not* shot may be as valuable as a knowledge of those areas in which they *are* taken.

To make this comparison it will not only be necessary to study certain maps and tables appearing in this paper but certain other maps and data appearing elsewhere. These are:

(1) Map 1 and 2, from: *The Dispersal of Wild Ducks from the W. K. Kellogg Bird Sanctuary, Near Battle Creek, Michigan.*

(2) Map 2 and 3 from: *A Waterfowl Banding Study on a New Impoundment.*

(3) A progress report entitled: *Migration of Some North American Waterfowl, Special Scientific Report (Wildlife) No. 1, U. S. Fish and Wildlife Service and National Wildlife Federation.*

Analysis and Discussion

From *Map III* of this report it can be seen that a decided minority of spring-banded Pymatuning mallards and blacks reach the Atlantic Coast; when so, mainly in South Carolina.

From *Map IV* of this report it can be seen that fall-banded (1948) mallards and blacks are mainly Mississippi Flyway birds. When they reach the Atlantic Coast, it is only in South Carolina.

Dr. Miles D. Pirnie's maps from the Kellogg Bird Sanctuary show that lower-Michigan banded mallards and blacks have very little tendency to visit Pennsylvania, or even to pass over it. They are essentially birds of the Mississippi Flyway. Those that are taken in Atlantic coastal states are taken mostly in South Carolina.

The results of banding in north-central Ohio on the Charles Mill Reservoir of the Muskingum Watershed Conservancy District by Warren (1939-41 inclusive) gave essentially the same picture as Pirnie's work. Pennsylvania gunners took but one Ohio-banded duck of the 3,228 banded. The returns were mostly obtained in the Mississippi Flyway. South Carolina again took more than any other state of those blacks and mallards that did reach the coast.

From all this evidence we conclude that, insofar as black ducks and mallards are concerned, the Pymatuning Refuge (and probably all of the glaciated portion of northwestern Pennsylvania) belongs essentially to the Mississippi Flyway, since the spread of these two species from Pymatuning is essentially southwest and northeast. The concentration of take along the Lake Erie-Lake Ontario-St. Lawrence axis leads us to believe that the southwest-northeast movement lies to the northwest of Pymatuning, and that Pymatuning (and again probably the entire northwest Pennsylvania glaciation) lies on the south-east edge of this route.

Map IV, showing the location of take of the Fall 1948 Pymatuning bandings, further bears out this thought. The value of the direct returns shown on this map should not be underestimated in spite of their relative paucity.

If we examine the direct mallard and the direct black duck returns, as depicted by Hawkins and Addy in the Fish and Wildlife's *Special Scientific Report,* the outstanding conclusion upon which we arrive, insofar as the Commonwealth is concerned, is that many mallards and blacks are passing through Pennsylvania and that few are being taken therein. Addy describes this particular phase, insofar as the black ducks are concerned, as originating from banding stations "at Lake Scugog, Ontario (just north of Lake Ontario), Rochester and Buffalo from which the birds fan out to the southeast, south and southwest. Direct recoveries from Lake Scugog, for example, show that about 35 percent were in the Middle Atlantic States from New York to North Carolina; 15 percent in South Carolina, Georgia and Florida; and the remaining 50 percent scattered as far west and south as Michigan, Illinois, Texas and Alabama. East of central New York the flights are predominately toward the Middle and South Atlantic States. Birds entering the United States west of New York and Pennsylvania do not winter in any significant numbers in the Middle and North Atlantic States, but are found primarily in the Mis-

sissippi drainage basin and along the Gulf coast with a relatively small percentage terminating their flights in South Carolina, Georgia and Florida."

From Addy's report, and from evidence brought forth in *Map III* and *Map IV* of this report, it is evident that western Pennsylvania should be vitally interested in the black duck population comprising the "southwest fanning" of the New York and Ontario bandings. It is also evident that to intercept this flight is biologically sound and physiographically possible in Pennsylvania's northwestern glaciated section. To carry our reasoning further, we can safely state that Ohio can intercept this flight in its northeastern glaciation (a continuation of Pennsylvania's northwestern glaciation). It is now also apparent that the black ducks banded at Charles Mill Reservoir in north central Ohio by Warren (1939-41 inclusive) were part of this northeast-southwest flight along the Lake Erie-Lake Ontario-St. Lawrence axis. (See *A Waterfowl Banding Study*, etc.)

Table 2a of this report, while admittedly weak in some respects, does show that Ontario, New York and South Carolina are closely concerned with Pennsylvania black ducks.

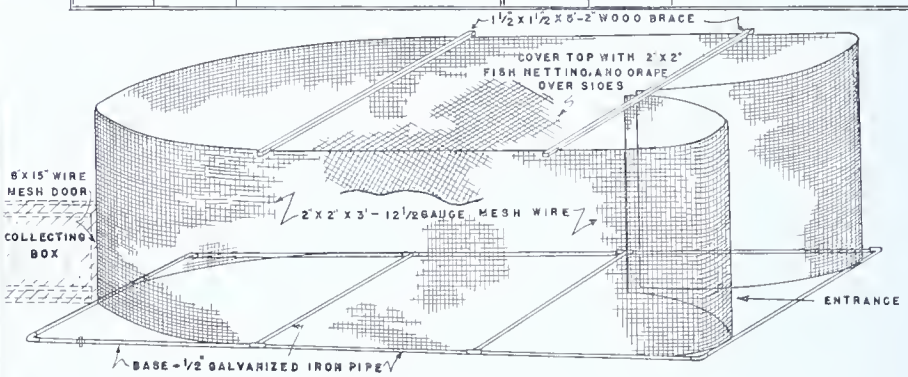
Much may be said regarding the "fanning out" to the south and the southeast of black ducks banded in eastern Ontario, Rochester, and Buffalo as pointed out by Addy in *Special Scientific Report No. 1*. It appears from Addy's map showing returns of these categories that most of these ducks pass through Pennsylvania en route to the Atlantic coastal states where they are taken in numbers. Very few are taken in Pennsylvania, however, and those that are shot can be noted from *Map II* and the *"2"* series of *Tables* of this report. It is also evident from *Map II* that glaciated northeastern Pennsylvania, with all its lakes, does not offer much incentive to these transients, for in number of banded ducks reported as having been taken, this section reports fewer than southwestern Pennsylvania. Apparently the Susquehanna River, from Snyder County downstream, the lower Delaware River, as well as the Reading Reservoir region, are more nearly desirable. At any rate more bands are reported from there.

From Hawkins' map showing distribution of mallard returns (*Special Scientific Report No. 1*) it can be seen that a somewhat similar condition exists with this species, inasmuch as there is a considerable flight from western New York that travels in a south-easterly direction across Pennsylvania to the Atlantic Coast with not many being taken in Pennsylvania. Across Niagara Falls and Lake Ontario from Buffalo, and emanating from Scugog (apparently), are a number of mallards that split between going through the western part of Pennsylvania, apparently en route to the southern states of the Atlantic Flyway, and going to the Mississippi in much smaller numbers.

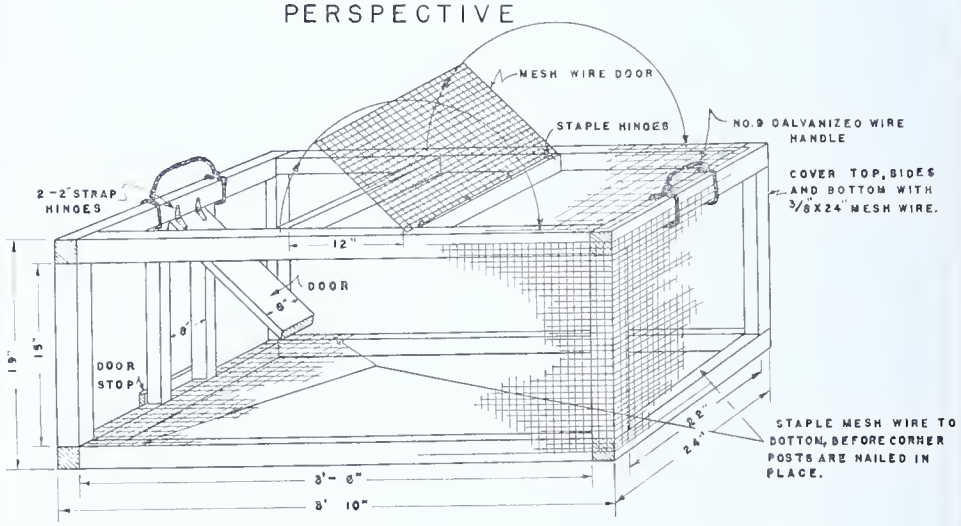
It will be impossible to go into the matter of migration of all the various species of waterfowl at this time inasmuch as our knowledge is not all-encompassing at the moment and because we desire only to touch on the subject to the extent that Pennsylvania's state-wide waterfowl management plans may have the benefit of information considered pertinent to such a program. Inasmuch as the black duck and the mallard are so important to the Pennsylvania hunter, it was thought necessary to go into a rather exhaustive discussion of these species.

MATERIAL REQUIRED

DUCK TRAP			COLLECTING BOX		
QUANTITY	SIZE	KIND	QUANTITY	SIZE	KIND
40'	1/2"	GALVANIZED IRON PIPE.	25'	3/8"X 24"	MESH WIRE.
4	1/2"	ELBOWS.	36"	2"X 2"	CLEAR W. P. LUMBER.
4	1/2"	TEES	1 PIECE	1"X 5"	DOOR STOP.
3	1/2"	UNIONS.	1 PIECE	1"X 6"X15"	DOOR.
25'	2"X 2"X 3'	12 1/2 GAUGE MESH WIRE.	2	2"	STRAP HINGES.
1	12 X 22'	2"X 2" FISH NETTING.	2 PIECES	NO.9	GALVANIZED WIRE(BOX HANDLES)
2	1 1/2"X1 1/2"X5'-2"	WOOD STRIP.	6	STAPLES	FOR (TOP) DOOR.
15'	APPROX.14	GAUGE WIRE (SINGLE STRAN)			
4		HOG RINGS (DOOR HINGES)			
1-LB	7/8"	GALVANIZED NETTING STAPLES.			


1 1/2 X 1 1/2 X 6'-2" WOOD BRACE
COVER TOP WITH 2"X 2" FISH NETTING AND DRAPE OVER SIDES
6"X 15" WIRE MESH DOOR
COLLECTING BOX
2"X 2" X 3'- 12 1/2 GAUGE MESH WIRE
ENTRANCE
BASE - 1/2" GALVANIZED IRON PIPE

PERSPECTIVE



COLLECTING BOX

SCALE 1 1/2" = 1'-0"

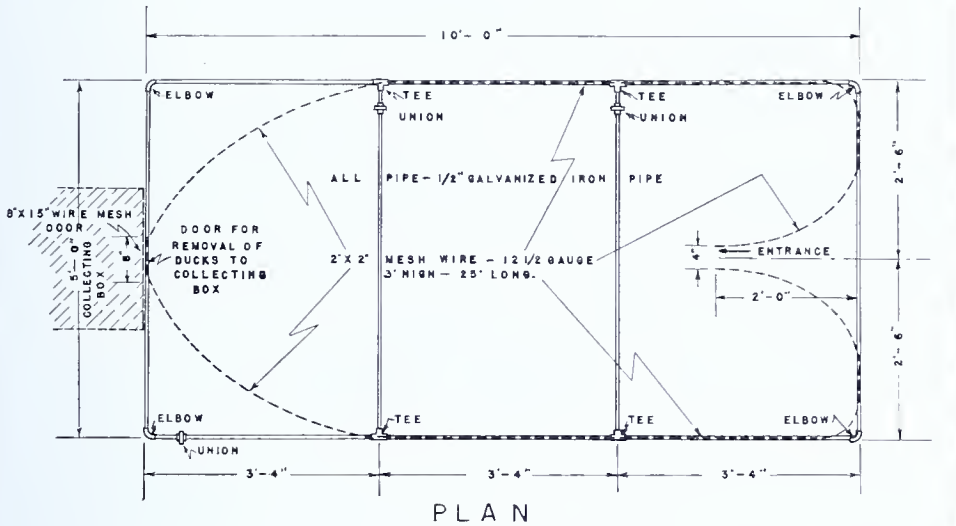
PENNSYLVANIA
GAME COMMISSION

...PORTABLE DUCK TRAP...

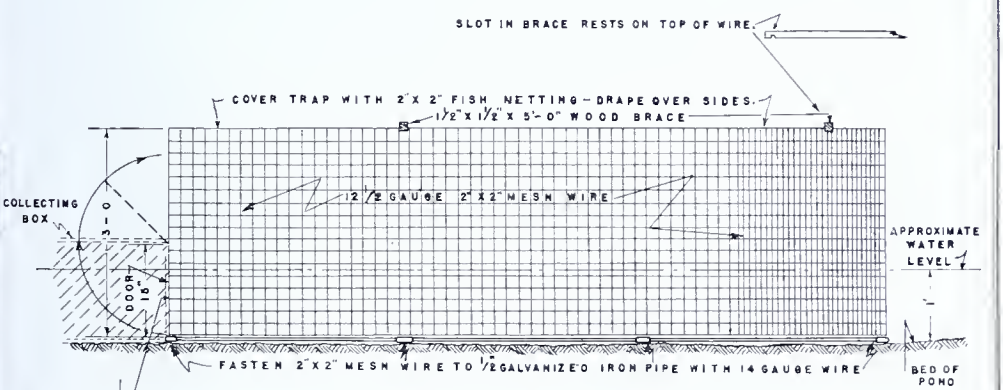
HARRISBURG, PA.

SCALE 3/4" = 1'-0" PR-30R.

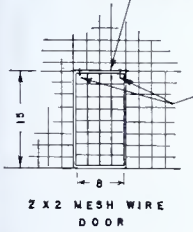
L.A.W. '30



PLAN


SLOT IN BRACE RESTS ON TOP OF WIRE.
COVER TRAP WITH 2"X 2" FISH NETTING - DRAPE OVER SIDES.
1 1/2"X 1 1/2"X 5'-0" WOOD BRACE
COLLECTING BOX
3'-0"
12 1/2 GAUGE 2"X2" MESH WIRE
DOOR 15"
APPROXIMATE WATER LEVEL
FASTEN 2"X2" MESH WIRE TO 1/2" GALVANIZED IRON PIPE WITH 14 GAUGE WIRE
BED OF POND

SIDE ELEVATION



That many other species besides the black duck and the mallard traverse Pennsylvania is a well-known fact. A glance at Dr. Harold Wood's *Table 1* gives us an idea of what species have visited the Susquehanna River at Harrisburg in bygone years, and still visit in greatly diminished numbers. Erie Bay is visited by greater and lesser scaup, canvasbacks, redheads, mergansers, and other divers in addition to pintails, blacks, mallards, and others.

An interesting comparison can be made between Erie Bay, Pennsylvania and Sandusky Bay, Ohio. Both are in Lake Erie, but while Erie Bay has little drainage into it, Sandusky Bay has much. In 1859 it is recorded in the *Agricultural Yearbook of Ohio* that 500,000 ducks were shipped to the eastern seaboard from Huron County, which county in those days included Sandusky Bay. There are also records showing that wild celery was most abundant at that time in the Bay and, since ducks were abundant as well, an ideal situation prevailed for the market hunters.

As years went by, agriculture increased in the Sandusky Bay watershed both in amount and intensity. So much topsoil was lost in the process that the Bay was gradually silted to such a depth that the celery was no longer able to survive. In Erie Bay, on the other hand, both celery and ducks persist. Together they produce rather good duck hunting because the Bay remains free from silt and the water is clear.

Dr. Frederick Lincoln points out that since no diving ducks of the genus *Nyroca,* except the ringnecked duck, breed in the eastern part of the continent, it follows that almost every canvasback, redhead, and greater and lesser scaup seen in Chesapeake Bay, Back Bay, and other middle Atlantic coastal waters has had to make a cross-country flight across Pennsylvania and northern West Virginia. *Map II* of this report shows where some of these have been taken in Pennsylvania.

WINTERING

Relatively few ducks and geese winter in Pennsylvania. The figures listed below are estimates obtained by field men of the Pennsylvania Game Commission, and others, during the January 1949 census. Because 1949 was a mild winter it is likely that the figures are close to the maximum.

Carl Lorrup, Deputy U. S. Game Management Agent of Glenolden, Pennsylvania, reported the following in the lower Delaware River-Tinicum Marsh region: 9,500 pintails, 11,000 black ducks, 200 mallards, 800 teal, 600 scaup and 1,500-1,800 ruddy ducks.

District Game Protector Raymond Sickles of the Pymatuning Refuge reported 500 black ducks, 500 mallards and 600 Canadian geese on that area.

District Game Protector Clifford Ruth of Erie, Pennsylvania, reported 20 mallards, 100 black ducks, 100 redheads, 700 scaup, 200 swan, 500 mergansers and 500 unidentified ducks in Erie Bay.

From Conneaut Marsh, District Game Protector George Keppler reported 900 ducks, mostly blacks and mallards.

The mile-wide Susquehanna River from Sunbury downstream has certain localities that appeal to wintering blacks and mallards. The area upstream from the Safe Harbor Dam is perhaps the most attractive. Other localities, such as the river within the limits of the City of Harrisburg, attract many ducks from time to time. No doubt the stage of the river, temperature, and food supply influence their behavior.

These are the essential points of winter concentrations: the Delaware River ducks trading up and down from perhaps the Penn Manor Region into Delaware Bay, and the Susquehanna River ducks trading down into the Chesapeake Bay.

NESTING

The writer must confess that he has been unable to accomplish much in the way of adding additional scientific information to the subject of Pennsylvania waterfowl nesting.

It is obvious that relatively few ducks nest in the Commonwealth because the physiography of the state is not attractive. The unusual records observed at Pymatuning a number of years ago are of course outstanding both as to quantity of the commoner species (mallard, black duck, blue-winged teal), as well as to the presence of very few of the unusual species.

The establishment of wild Canadian goose nesting in the Pymatuning Refuge region has been successful and has increased the number of successful goose hunters in that section. District Game Protector Sickles reports that during the 1949 season at least 550 geese were taken in the refuge vicinity. It is not known how many of these were produced locally.

Acre for acre, the Tinicum Marsh is as important a waterfowl nesting area as remains in the state today, but even here the production of young ducks is small.

Since beaver have become established in Pennsylvania, over 24,000 have been trapped. Needless to say, the impoundments created by this population would have cost man himself (were he to build them) much time, effort, and money. An examination of representative ponds reveals that while some are excellent for nesting, a good many others offer little inducement. District Game Protector Elmer Simpson reports that on one of the best beaver ponds north of Cambridge Springs over 100 young ducks were reared during the 1949 season. It would seem that age, depth of pond, and type of soil and margin would in the main determine nesting desirability.

District Game Protector John Lohmann of Milford, in the northeastern Pennsylvania glaciation, reported that the best duck hunting his district ever had was on a new beaver pond near Milford. Since Lohmann's district comprises a representative section of a region through which many black ducks are apparently passing without stopping, his report should be commented upon. It is probable that the reason for the excellent duck hunting experienced by Mr. Lohmann was the direct result of a new beaver dam flooding a stand of perhaps millet, chufa, or smartweed. If this be true, perhaps an answer to improved duck hunting could be an intentional water level fluctuation on selected areas.

PREDATION

During the course of this research, ducks were trapped and banded on the Reading Reservoir. On September 26, 1949 it was noticed that raccoons were being attracted to the trapped ducks and were getting into the duck trap and robbing it. Examination of the surroundings disclosed that at least 14 ducks had been taken. Steps were immediately taken to combat this situation, and, from September 26 to October 16, thirteen raccoons were taken from the trap site. At another trap site five raccoons were taken.

On the Pymatuning Refuge, District Game Protector Sickles reports that raccoons are also extremely numerous and that at least one wild goose nest was destroyed by them.

It is obvious that Pennsylvania's raccoon population is high and has been for some time. While some of the events set down in the above paragraphs were brought about by unnatural conditions, nevertheless it would appear that some predation is being wrought by them.

There is also the possibility that the reason for late wood duck nesting in artificial nesting boxes erected on the Pymatuning Refuge on poles placed in the water, was brought about by earlier nests in trees having been destroyed by raccoons.

DISEASE

In September and October 1949, two widely separated outbreaks of botulism were reported in Pennsylvania. One locality of occurrence was the Tinicum Marsh at Philadelphia where members of the Delaware Valley Ornithological Club discovered an illness of shore birds. This discovery was made in a region where muck and silt were being pumped from the Delaware River into the marsh.

This sickness involved hundreds of shore birds but apparently no ducks were affected. Discovered on Labor Day, many birds had already died and were in various stages of decomposition. Approximately 40 sick birds were captured and taken to the Philadelphia Zoo where they were cared for. The greater portion of these recovered.

No tests were made on the Tinicum birds to ascertain absolutely the cause of their sickness. It is assumed by officials of the Zoo, however, that the sickness was botulism. Mr. John Griswold, Curator of Birds, and Mr. Fred Ulmer, Curator of Mammals, were the officials who made this diagnosis.

Mr. Nelson Hoy, business man and ornithologist from Sharon Hills near Philadelphia, reports that hundreds of birds were killed by the disease and that he himself discovered 27 dead on September 6, 26 dead on the 8th, and 26 dead on the 9th.

According to Mr. Ulmer the birds involved were: western sandpiper, semipalmated sandpiper, white-rumped sandpiper, pectoral sandpiper, greater and lesser yellowlegs, semipalmated plover, killdeer, least sandpiper, Hudsonian godwit, and perhaps others.

Herbert L. Ratcliffe, Sc. D., a pathologist for the Penrose Research Laboratory, also stated that it was reasonably certain that botulism was the cause of this outbreak.

The second outbreak was discovered on the Susquehanna River near Washington Boro, Lancaster County, on October 2 and 3. It involved hundreds of ducks including blacks, mallards, and pintails.

Mr. John Eicholtz, District Game Protector, took five dead black ducks and one live one to the Bureau of Animal Industry, Department of Agriculture, Harrisburg. Their laboratory diagnosis showed that the cause of death was botulism.

Several other sick ducks that were treated recovered from their illness, were banded, and released.

CONCLUSIONS AND RECOMMENDATIONS

1. Waterfowl of many species traverse the state, but comparatively few are raised therein, and comparatively few are taken.
2. Banding evidence to date shows that black ducks and mallards, traversing the northwest Pennsylvania glaciation, are mostly of the Mississippi Flyway (as are probably the Canadian geese), while diving ducks utilizing this same northwest section are for the most part of the Atlantic Flyway.
3. The Susquehanna River is an important avenue for many species and is utilized not only by certain mallards and black ducks from New York and Ontario, but by Canadian geese as well. Redheads, canvasbacks, greater and lesser scaup, and ringnecked ducks also utilize this route. The river itself (and certain of its tributaries), in addition to serving as a flight lane, may also, under certain conditions, serve as a resting ground as well as a source of food.
4. Many ducks, especially black ducks, along with an undetermined number of Canadian geese, pass through the glaciated northeastern Pennsylvania lake country. This is traversed en route to the coast from New York, Ontario, and western Quebec. A few ringnecked ducks undoubtedly utilize this region. Banding records show that but a comparative few of these transients are taken in Pennsylvania.
5. The role of farming in a waterfowl management program is an important one especially in the Pymatuning region as well as in the Reading Reservoir section. The value of utilizing this tool elsewhere, where necessary and practical, is obvious.
6. The physiographic type lending itself best of all to waterfowl management is the glaciated northwestern portion of the state. There are, however, two additional areas in the southeastern part of the state that should be purchased and developed as waterfowl refuges.
7. The glaciated portion of northwestern Pennsylvania should be treated as one waterfowl unit. An effort should be made to coordinate management plans for this physiographic division with the identical and contiguous area in northeastern Ohio.

8. Ways and means of coordinating certain marsh restoration plans with certain Department of Highways plans should be fully investigated. Dual-purpose highway fills may benefit, and in some instances create, certain marsh restoration projects. This is probably most important in glaciated northwestern Pennsylvania.

9. The Cranberry Glade impoundment on State Game Land No. 111 in Somerset County should be made a refuge and an experimental area. Water levels should be controlled and manipulated to produce waterfowl food. Located as it is, in the southern extremity of the Allegheny Mountain Section (see *Map I*), it would be extremely interesting and educational to ascertain and measure response to this area by waterfowl passing through this unusual country (for waterfowl, at any rate) en route to the Atlantic Coast.

10. At least two water level-control areas should be set up in the glaciated northeastern portion of Pennsylvania and held as refuges. Such areas should be managed to produce a maximum of waterfowl food. Similar action should be taken in the northwestern glaciated area. The results obtained could determine future plans of a much greater scale.

11. The so-called waterfowl refuge on the Susquehanna River, within the City of Harrisburg, should be made an actual refuge by enforced protection. The effect of such action on diving ducks, in particular, should be carefully noted. The results obtained could possibly determine what action, if any, of a similar nature, should be taken on the Safe Harbor Dam on the Susquehanna River below Columbia, as well as upstream in the Selinsgrove region.

12. Waterfowl banding should be continued at Pymatuning and Reading, and should be expanded to include geese at Pymatuning. This could easily be accomplished. If at all possible, waterfowl should be banded on the Susquehanna River, either in the City of Harrisburg, or possibly at Safe Harbor, as well as on the Delaware River in the Penn Manor region or the Tinicum Marsh.

13. A knowledge of what ducks and geese actually eat while in Pennsylvania would be of great value in a management program. The collection of duck and goose stomachs from representative sections of the state, from the various species as well as during the various seasons, is strongly recommended.

14. The potential value of certain type farm ponds, both for nesting and for hunting areas, should be recognized and encouraged. It is likely that these smaller areas would be of greater value if set up in conjunction with a large state-owned waterfowl refuge serving as a nucleus of attraction.

15. The potential value of certain flood-control reservoirs, proposed and actual, should be recognized and integrated into the state-wide waterfowl program. At present the Blanchard, the Kinzua, and the Shenango proposals seem to offer more than the remainder.

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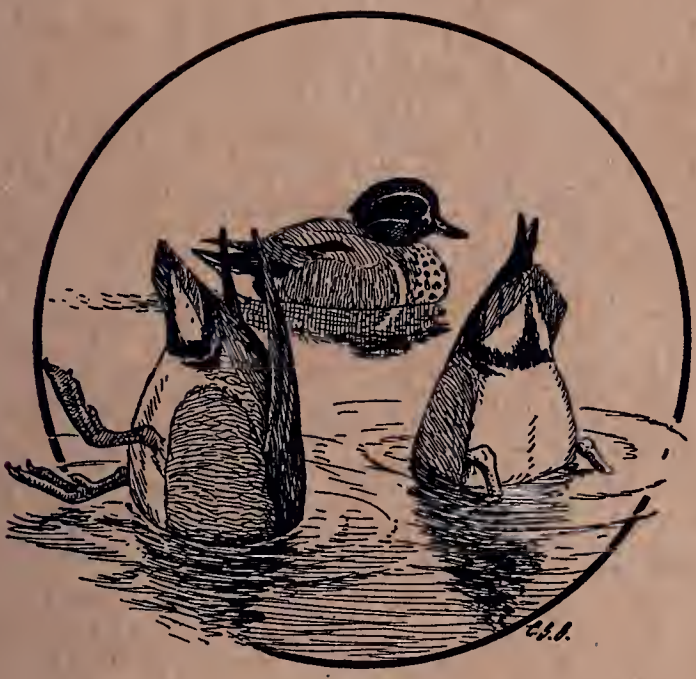

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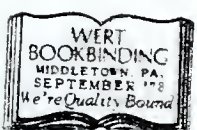
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